

ATTACHMENT I

ILLUSTRATIVE ANALYSIS OF PROPOSED OYU TOLGOI MINING CONTRACT

I. Introduction

The Hural and all Mongolians should perform some analysis of the financial aspects of the proposed Oyu Tolgoi mining contract in order to gain an understanding of the gains and losses of the contract relative to other options, the effect of relevant economic variables on the returns to Mongolia and to the investor and how risks might affect those returns.

Some analysis is provided here in order to illustrate the type of work that is necessary for making informed decisions. The analysis is illustrative because results are based on a number of assumptions and data publicly available (see assumptions). Some emphasis is placed on the assumptions and data limitations because it is important for the Hural and all Mongolians to request that such data be provided by the government (as well as any analysis conducted by the government) so that there is a basis for common understanding.

Despite the illustrative nature of the analysis, a number of important issues are raised; issues that should be addressed before even an informed discussion can take place, much less a reasonable decision. These issues include:

1. Clarification of how a number of computations will be made (the royalty for instance);
2. Clarification of how the smelter and electricity options will affect the financial viability of the project from Mongolia's and the investor's point of view;
3. How Mongolia will address the significant increase in mineral price risk it will bear because of the need to finance equity participation and to operate a smelter;
4. What Mongolia's capacity to monitor the process is and how Mongolia will ensure that any administrative capacity limitations are addressed; and
5. What Mongolia's options are with respect to other uses of funds that will be required to finance that equity participation.

II. Nature of the Analysis

Suppose a person who owns five hectares of land is asked to evaluate the following proposal: “Sell me your land and I will give you 100,000 Tugrugs plus 10% of the value of crop production for the next ten years.” As stated, this proposal has little or no meaning and the person must have some context for deciding whether the proposal is a good deal. That context is provided by:

1. Listing alternatives (such as using the land for own production, selling the land for housing or leaving the land unproductive in hopes of future land price increases),
2. Computing the monetary value of the income flows from the proposal and alternatives
3. Computing the present value of the proposal and the alternatives, and
4. Performing some sensitivity (or risk analysis) to gain some understanding of how the different economic factors affect the outcomes.

One such analysis is provided for the Oyu Tolgoi deposit for illustrative purposes here. In particular,

1. The proposed contract is compared to one alternative: use of the current legal framework,
2. The monetary values for the mine to the investor and Mongolia are computed for the term of the contract,
3. The present value of each option is computed, and
4. Prices, debt structure and interest rates are used to illustrate how changes in these variables affect the size and ranking of the two alternatives.

III. Assumptions

- a. The fiscal regime used for this analysis is provided in Table 1. Current law and the proposed contract structure are compared. Among the differences between the proposed contract and current law note is made of the requirement that Mongolia pay a share of any future capital

expenditure, the exemption from the windfall profits tax, the investment credit and the five year loss carry forwards.

- b. Table 2 contains the assumptions made in order to produce the illustrative results. Note is made of the following factors
 - i. Extraction and investment are based on the provisions in the proposed contract.
 - ii. The term of the analysis is the term of the contract.
 - iii. Costs and the structure of revenues are based on the Executive Summary provided by Ivanhoe in 2005.
 - iv. It is assumed that the present value of the mine will not be affected by either how electricity is supplied or whether the smelter is built. In effect, pricing to the mine is assumed invariant to the source of ether electricity or the supply of smelting services.
 - v. The present value of either a domestic smelter or expanded electricity production for supplying the mine is effectively zero. That is, only the mine is being examined here. A separate analysis is required to examine the effects of the smelter and any options for electricity supply.
- c. Three options are considered
 - i. Current Law
 - ii. The Proposed Contract
 - iii. The Proposed Contract with the Windfall Profits Tax Imposed (Sales from the domestic smelter are exempt but exports of concentrate are taxed)

IV. Base Case

- a. One case has been selected to represent the base case for the present analysis. The following additional assumptions are used to compute the results for the base case:

- i. Price of copper = 2.00 \$US per pound
- ii. Price of gold = 500 \$ per ounce
- iii. Interest Rate = 10%
- iv. Inflation Rate = 0%
- v. Debt Structure = 50% debt financed at 10%

b. Results for the base case are contained in Table 3

- i. As shown the contract has almost no effect of the share of the present of the net present value to Mongolia retains relative to current established law, while retaining the Windfall Tax in the current contract shifts about 6% of the present value toward the Mongolia.
- ii. On average the investor's return (measured as the internal rate of return) increases (from almost 40% to almost 54%) when the contract is applied, but the investor's return is reduced to about 42% when contract terms and the windfall tax are combined.¹ This means that the timing of Mongolia's cash flows, while higher, are shifted more toward the future. This results because the windfall tax is not applied in the early years and the government has negative cash flows for some years because of the need to finance its share of the investment, among other reasons. More cash later is more risky. Thus, a tradeoff may have to be made about the amount of additional risk borne by Mongolia, other things equal.²

¹ A number of restrictive assumptions are necessary in order for the internal rate of return to have meaning as an investment decision tool. In addition, the internal rate of return will not be unique for the current mine because of the cash flow structure. What is reported above are the values computed by the computer program without searching for other solutions. While the internal rate of return has the serious limitations noted above, the implications for the timing of Mongolia's payments are unambiguous. Taxes with the windfall tax are delayed because all output in the early years will be exempt from the Windfall Tax if the smelter is built. The results will be adverse for the investor if smelter construction is delayed.

² The internal rate of return can be computed for Mongolia with the contract because there are negative cash flows during the early project years to finance the 34% investment costs. The value reported is significant being in excess of 76%. Nothing should be made of this value, however. The reason is that the internal rate of return for the current law is infinite because the government never spends cash on the project (in a financial sense). Thus, Mongolia's internal rate of return has, in reality, fallen. This is another reason why the internal rate of return is not an indicator of profitability. (Note should be made of the fact that the opportunity cost of the reserves in the ground is being treated as zero in order to make the current absolute computations. In reality Mongolia is forgoing significant value by devoting the reserves to this particular use.) Some recognition of this opportunity cost would be necessary to provide a complete analysis.

- c. On balance, Mongolia fairs better with the contract, given current assumptions. Of course the probability is zero that this value will be realized. Thus, it is important to provide more context by way of some sensitivity analysis.

V. Some Analysis

a. Overall Project

Two experiments were conducted to determine lower bounds for the overall project, regardless of how the gains and losses are distributed. This information is helpful because no party would invest in the project if these values were realized.

i. Minimum Price

One indicator of risk is to calculate the price that makes the present value of the project less than zero. This value was computed to be about .42 \$US maintaining all the other assumptions noted above. This value is significantly less than the current spot price for refined copper but is within the range of possibility given the history of copper prices and the long term nature of the project.

ii. Costs Rising Relative to Price

General price inflation will not affect the overall present value of the project. Changes in relative prices will affect the present value, however. For instance, wages and other input costs rise in excess of the general inflation.³ Thus, it is of interest to ask what rate of relative cost increases will result in a negative present value? This value was computed to be about 10.5% maintaining other assumptions. The mine would close in about fifteen years with no changes in either the fiscal regime or the technology employed because costs would be perpetually greater than sales values.

b. Comparative Analysis

Some sensitivity analysis of three factors (price, financial structure and interest rates) is provided to illustrate how the relative ranking of the two alternatives (current law and proposed contract) might be affected. Mongolia's share of the present value is used as an indicator of relative value at each step. The present value to be allocated

³ An increases in the real wage is one indicator of positive economic growth

between the parties changes with changes in the values in questions. Once the overall present value is computed, however, the proportion accruing to Mongolia will differ depending on the fiscal regime. Thus, using Mongolia's proportion of the present value is a reasonable indicator for the task at hand.

i. Price Changes

It has been established that neither party would invest in Oyu Tolgoi if copper prices are below .85 US dollars given current assumptions. At prices above this value, Mongolia's share of the present value under each regime increases with price. To repeat, Mongolia gains relative to the investor when prices rise regardless of the fiscal regime. In the case of current law, the government gets a greater proportion of revenue from the windfall tax as prices rise because costs do not vary for this tax. Under the proposed contract or current law, the royalty and income tax increase Mongolia's share. A 10% increase in output prices will increase taxable profits by more than 10% holding costs constant and thus the government will gain relative to the investor when prices rise.

The relative behavior of the three options for price changes is reported in Figure 1 and Table 4. Either contract option is favored when prices are relatively low but that result is switched as prices increase. The reason for this result is, in part, that Mongolia will accrue greater than proportional gains from high prices with the windfall tax relative to equity sharing under current law. This benefit is mitigated in part by the contract with a continued windfall profits tax and completely with the windfall profits tax exemption.

ii. Changes in Financial Structure

The amount of debt will affect Mongolia's returns in two ways. First, interest expense is deducted from profits taxes. Second, if the contract is adopted then Mongolia will have to finance less of the initial investment because loans will be made to the domestic company operating the mine. This gain is offset by the requirement that interest and principal will have to be repaid at some later date. In general, any investor would seek to finance with debt, however, as long as the cost of debt is less than the cost of equity (or own source) finance.

The effect of changes in financial structure is reported in Figure 2 and Table 5. Mongolia's share falls regardless of regime because of the reduction in profits tax.

iii. Changes in the Discount Rate

Different investors will have different discount rates given their risk preferences, wealth and other factors. The discount rate used to discount financial flows from Mongolia's perspective is not known to us. Thus, some experiments using different discount rates were conducted while maintaining all the other base case assumptions. These results are reported in Figure 3 and Table 6. The relatively attractive nature of either alternative proposed contract disappears as interest rates increase.⁴ Thus, the contract is favored at low interest rates while current law is favored at high rates, below about 12%, while the proposed contract with the windfall tax is favored until about the discount rate reaches about 20%.

This result reflects the shift of revenue to the future under the contract relative to current law. Several factors in the contract reduce Mongolia's revenue in the early years including elimination of the windfall tax, longer loss carry forwards, the investment tax credit and the need to finance the investment. More revenue accrues in later years because of equity participation. Thus, the net effect of this tradeoff depends on the discount rate applied.

The contract becomes unattractive relative to current law for Mongolia at discount rates in excess of about 12%, (and about 20% for the contract with the Windfall Tax). Thus, it is important to ask whether these rates are too high (or too low) adjusted for risk. One answer is indicated by stock market returns. An estimate of the expected returns to Rio Tinto and Ivanhoe are 20.90% and 22.46% respectively.⁵ This compares to an average 14.62% return for international markets on average for the past five years. The difference is simply an indicator that mining is risky relative to most economic investments and that investors require higher returns in order to bear that risk. That is, if the estimate is correct then if either company accepted a project with a

⁴ The fact that the values for the contract begin to increase is not relevant because the rate of change for the contract is always less than the rate of change for current law for all feasible outcomes. By feasible, we mean having positive present values. The present value of the project becomes negative at interest rates above about 40%.

⁵ These values were estimated using what is known as the Capital Asset Pricing Model (CAPM). World returns, measured by the Standard and Poor's 1200 International index have been 14.62% over the past 5 years. A risk free rate may be the US 30 day Treasury Bill rate, currently at 4.7%. The measure of relative stock price volatility (known as "beta" in the literature) has been estimated to be 1.633 for Rio Tinto and 1.79 for Ivanhoe. These are nominal returns and are not adjusted for personal income taxes, so are tax inclusive. Inflation adjustments would reduce the value to about 19% given dollar inflation.

present value less than zero when discounted at about 20%, nominal, would experience a fall in stock prices, other things equal.⁶

There are reasons to believe that Mongolia's ability to bear risk is lower relative to the equity owners of either mining company for a number of reasons:

1. Mongolia has only two million people,
2. Mongolia's economy is not as diversified as the world capital market,
3. The cost of diversification may be higher for Mongolia relative to equity holders of mining companies who have relatively cheap access to a variety of financial instruments to diversify their risks, and
4. Mongolia is relatively poor.

These and other factors may indicate that Mongolia's cost of risk bearing is at least as high as that of the enterprises. Thus, it is important that the government clearly articulate the reasons for undertaking additional risks (via equity ownership and having a domestic smelter) as well as explaining how these increased risks will be accommodated before a decision can be made about the relative merits of the proposed contract.

⁶The cost of risk bearing for the mining firms might be even higher for projects in Mongolia relative to projects in countries like Australia and Canada because of differential political risks.

VI. Summary

This presentation has been illustrative and should be refined. The results, however, are suggestive of the types of issues that should be raised during the public debate about the merits of the proposed contract. The Hural and Mongolians in general should request a number of things before discussing the proposals. The requests should include:

- a. Any numerical and financial analyses performed by the government,
- b. Estimates of operating costs, sales contracts and other information necessary to construct reasonable estimates of cash flows, and
- c. Technical details about how particular values will be computed (dividends, royalties, and other items noted in Table 2).

Finally, Mongolians need to examine the four separate aspects of the project from a risk and return perspective. The four aspects are:

- a. Mongolia owns the asset in the ground and needs to get a competitive return from owning that asset.
- b. Mongolia is a tax collector and taxes will become more dependent on mining unless steps are taken to diversify the government's revenue base.
- c. Mongolia is considering making an equity investment in the mine's plant and equipment in addition to owning the reserves.
- d. Mongolia has had an explicit policy of inducing the construction of a smelter via the windfall export tax, a facility that might be economically inefficient.

It is true that owning some equity in the mine and having a smelter domestically will increase the proportion of the world price captured by Mongolia. The point, however, is that the price varies significantly and thus Mongolia's returns will vary more the greater the investment in mining equipment and downstream processes. In addition, such lack of diversification is costly because Mongolian must use funds to purchase equity and perhaps to subsidize a smelter that cannot be used for other purposes which might create even greater employment, economic gains and overall stability. It is possible to analyze each of the four elements joint and independently to obtain indicators of the risk and rewards from such an extensive commitment of domestic resources for one sector. Such an analysis should be performed before the Hural can make an informed decision.

At this point, information sufficient to make informed comparisons and decisions is not available. Thus, it is not possible to determine whether the proposed contract, as structured, is in Mongolia's long term interest.

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Table 1
Comparison of Current Law with Proposed Contract

Instrument	Current Law	Proposed Contract
Royalty	5.0 of sales value of products sold, shipped or used.	5.0 of sales value of products sold, shipped or used. ⁷
Profits Tax	<p>Rates: 10 percent if the annual taxable income was between 0-3.0 billion tugrugs</p> <p>300 million tugrugs plus 25 percent on taxable income in excess of the balance exceeding the 3.0 billion</p> <p>Investment Tax Credit: Mining is not a sector for which a investment tax credit is provided</p> <p>Loss Carry Forward: 3 years limited to 50% of taxable income each year applied.</p>	<p>Rates: 10 percent if the annual taxable income was between 0-3.0 billion tugrugs</p> <p>300 million tugrugs plus 25 percent on taxable income in excess of the balance exceeding the 3.0 billion</p> <p>Investment Tax Credit: Available for Initial Investment</p> <p>Loss Carry Forward: 5 years limited to 50% of taxable income each year applied.</p>
Windfall Profits Tax	<p>68% of positive difference between price and 2600 \$US per ton plus smelting and refinement costs for exported copper concentrate</p> <p>and</p> <p>68% of positive difference between price and 500 \$US per ounce for gold/</p>	Exempt

⁷ The wording in the contract differs from the wording the law. The differences may be due to translation. Thus, conditions, terms and application are assumed to be the same for current purposes. This assumption may not be correct and should be verified. This assumption will be maintained for all provisions unless otherwise noted.

Instrument	Current Law	Proposed Contract
Border Withholding Taxes	20% on dividends unless modified by treaty 5% for dividends to Canada 5% on interest unless modified by treaty 5% on payments for technology	Exempt if appropriately structured Interest, management fees, title fees and technical and mining costs paid by the Investor to Ivanhoe Mines Ltd., Rio Tinto and/or subsidiary companies located outside Mongolia's are taxed in accordance with the Double Taxation Agreement, or if such a treaty does not exist, in accordance with the Law of Mongolia. Presumably the rate will be 5%
Value Added Tax	10% (but there will be no VAT revenue from production of either concentrate or refined output if goods are exported)	10% (but there will be no VAT revenue from production of either concentrate or refined output if goods are exported) 3% interest accrues on excess credits until such time as either tax offsets are complete or refunds are paid.
Customs	Applicable rates according to Schedule	Exempt during construction and imposed at current rates during the post construction period
Stabilization	None unless agreed	Complete for all taxes including but not limited to the listing of taxes in Articles 16 and 17 of the General Tax Law. (excises, personal income tax, stamp fees, payments for water and mineral water, vehicle taxes, land payments and other taxes, charges or fees). Stability is asymmetric. If taxes rise the investor is protected. If taxes fall then the government must allow the investor the benefit of lower tax rates. For instance, expatriates and citizens of Mongolia pay personal income tax of 10%
Government Equity	Option for up to 34% government ownership provided in current law	34% government ownership granted on the date the contract becomes effective subject to an exemption from other requirements of Article 5 of the Minerals Law (Article 5 provides for state ownership share and the floating of 10 percent of the entity on the Mongolian stock exchange.) Government will have to satisfy the 34% share of all equity-financed investment costs after the agreement becomes effective.

Instrument	Current Law	Proposed Contract
		<p>Government may borrow funds from the Investor in order to finance its share of the investment. LIBOR plus 3.3% will be the interest charge. All loans and interest will be paid by forgoing dividends until such time as the loan balance is zero.</p> <p>Management fee of 3 percent of all capital costs up to date of production; 6 percent of all capital and operating costs thereafter.</p> <p>Mongolia may not dispose of its shares in whole or in part without the express authorization of the other shareholders</p> <p>Mongolia is to have no management powers.</p>

Table 2
Assumptions for Current Illustration

	Item	Assumption	Potential Bias Mongolia's Share
1	Royalty	5% of Net Smelter Return	High if transport cost and other processing costs are not included
2	Net Smelter Return	LME Price – (300 +.09(LME Price of Copper)) per ton	Low because gold price is not used. High if other charges are included (transport from smelter, penalties, etc.)
3	Inflation	0%	Low – Mongolia gains with inflation because the income tax system and the windfall tax are not adjusted for inflation.
4	Interest Rates	Same rate used for debt and return to equity. Interest rates vary by case.	Uncertain – depends on debt interest rates relative to equity cost of capital
5	Fiscal Regime	As described in Table 1	
6	Production	As described in proposed contract	
7	Investment Costs	As described in Proposed Contract	
8	Operating Cost	As described in Ivanhoe's Executive Summary	
9	Dividends	Defined to be After Tax Income less repayments of debt. Return of capital is defined as tax depreciation. (That is, it is necessary to separate repayment of initial capital from "dividends". Distributions can be made to shareholders when accumulated after tax profits are zero [or negative]. These payments are defined to be repayments of equity capital investment)	Low if dividends are defined to be any payment to shareholders other than a liquidating distribution or by some other rule.
10	Amortization of Corporate Debt	Interest paid in year accrued with a balloon payment in the last year of the project	Uncertain – If debt is retired earlier then income taxes will be higher earlier in the production period. Dividends will be lower earlier in the

	Item	Assumption	Potential Bias Mongolia's Share
			production period, however, because cash must be used to amortize the debt.
11	Amortization of Debt to Finance Mongolia's 34%	Mongolia forgo dividends and capital repayments until loan balance is paid	Uncertain --- Depends on the amortization schedule of Government Debt attributed to the project and the amortization schedule employed.
12	Treatment of Intangibles	Exploration and Production preproduction expenses amortized over five years on a straight line basis	High --- Treatment of intangibles is not clear in tax law (at least to me). Exploration expenses are amortized over five years but the treatment of other non-physical asset preproduction expenses is not well defined.
13	Domestic Smelter	<p>Assume that the NPV of the Smelter is zero.</p> <p>Smelter costs are assumed the same for domestic and foreign smelters.</p> <p>In effect it is assumed that there is no domestic value added from the smelter in Mongolia.</p>	<p>High --- The NPV of the smelter at competitive prices is probably less than zero.</p> <p>Otherwise the company would not have to be induced, via the windfall profits tax, to invest in the smelter.</p>
14	Electricity	<p>Costs are embedded in production costs. Thus, the price is assumed invariant to source of electricity</p> <p>Assume that NPV of electricity plant, if built is zero.</p>	High -- The assumption about pricing implies there are no domestic subsidies to electricity production.
15	Management Fees	<p>As stated in Shareholder Agreement for Proposed Contract</p> <p>Zero for Current Law</p>	High for analysis with current law.
16	Exchange Rates	Proportion of costs that will be paid in domestic currency is not known. Thus, it was assumed that the relative exchange will not change during the course of the	Unknown --- Bias depends on whether the US Dollar appreciates or depreciates relative to the Tugrug.

	Item	Assumption	Potential Bias Mongolia's Share
		project	
17	Debt Structure of Domestic Entity	If the domestic entity borrows funds then the amount of equity finance falls in proportion to equity participation for the government and the foreign investor.	
18	Concentrate Production	2% of Mine Output based on Ivanhoe's Executive Summary	

Table 3
Base Case Result

	Net Present Value	Internal Rate of Return	Shares of Net Present Value
Total Project	9,495.00	40.53%	
Current Law			
Investor	4,840.00	40.91%	50.97%
Mongolia	4,655.00	NA	49.03%
Proposed Contract			
Investor	4,823.00	54.87%	50.80%
Mongolia	4,672.00	60.09%	49.20%
Proposed Contract With Windfall Tax			
Investor	4,157.00	42.22%	43.78%
Mongolia	5,338.00	69.11%	56.22%

Assumptions: See text.

Table 4

Mongolia's Share of Present Value When Prices Change
(Shares Reported as Percentages)

Copper Price	Current Law	Proposed Contract with WPT	Proposed Contract
1.00	45.94%	50.18%	50.18%
1.50	40.14%	50.84%	50.84%
2.00	49.03%	56.22%	49.20%
2.50	63.44%	63.41%	46.51%
3.00	72.27%	67.73%	44.84%
3.50	78.21%	70.54%	43.68%

Table 5

Mongolia's Share of Present Value When Debt Structure Changes
(Shares Reported as Percentages)

Percentage of Debt	Current Law	Proposed Contract with WPT	Proposed Contract
0.00%	51.17%	57.60%	50.63%
25.00%	50.09%	56.92%	49.91%
50.00%	49.03%	56.22%	49.20%
75.00%	47.98%	55.59%	47.98%
100.00%	46.93%	54.90%	47.84%

Table 6

Mongolia's Share of Present Value When Discount Rate Changes

(Shares Reported as Percentages)

Discount Rate	Current Law	Proposed Contract with WPT	Proposed Contract
0.00%	46.81%	57.70%	51.70%
2.50%	46.79%	57.11%	51.02%
5.00%	47.13%	56.65%	50.34%
7.50%	47.86%	56.35%	49.73%
10.00%	49.03%	56.22%	49.20%
12.50%	50.70%	56.35%	48.77%
15.00%	52.98%	56.79%	48.49%
17.50%	56.01%	57.58%	48.39%
20.00%	59.99%	58.66%	48.51%
22.50%	65.31%	60.23%	48.90%

Figure 1
Effect of Copper Price on Mongolia's Share of Present Value
Proposed Contract Relative to Current Law





